

THE
ROMANCE OF TRANSPORT

The Romance Series

THE ROMANCE OF TRANSPORT

L. A. NAIESAN



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PREFACE

THE NATIONAL Council of Educational Research and Training did me the honour of requesting me to write a book on Transport for their "Romance" Series. The present book has been written in response to that request.

The evolution of transport from mere human footwork to the magnitude of a vast and worldwide network of surface and air transport is a long and fascinating story of Man's efforts to solve the problem of food and shelter, to keep himself free from the effects of the vagaries of nature and climate, to improve his control over his environment, to extend his influence to ever-widening areas, and to bring about the development of industry and trade.

There is, despite an initial doubt, indeed romance in the development and progress of transport. This comes to our view when it is seen how transport has been playing an increasing role in Man's life and activities. The history of transportation is not a mere account of the mechanical aids: the urge to spatial mobility is itself an urge to Man's survival and to the growth of civilization.

I have tried in this book to trace the main stages of the slow process of Man's conquest of distance on land, over water and in the air. In piecing together the essential details of this picture, particularly with reference to India, many authorities have had to be consulted. Some of the most important of these only—which the curious reader may feel inclined to consult—have been mentioned in the book.

If this book stimulates the interest of the reader and helps him to a better appreciation of the dominating influence of transportation in Man's life, his activities and economic progress the author's labours will have been amply rewarded.

My thanks are due to Shri D. Raghavan, Head, Publication Unit and his colleagues in the NCERT for having cheerfully borne with my demands

from time to time, particularly in connection with the preparation of the illustrations for the book. Shri N. C. Bhattacharya, the artist, has given me valuable assistance in rendering them in the form in which they appear in the book.

NEW DELHI

L. A. NATESAN

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In the Beginning

LIVING IS growing. Trees grow up and their roots go down into the soil. Animals are different. They move from place to place. Some like a worm creep along. Some walk on legs. Others paddle themselves through water. Still others fly through the air.

But why? All living beings must get food. It is not brought to them. Only when civilization developed, man had his food brought to him. Till then, man like all animals, had to go in search of food. Food gives the energy to keep alive, grow, fight enemies and escape from them and survive.

Millions of years ago man evolved from lower forms of life. Man lacked what other animals had. He did not have greater physical strength nor the claws and fangs with which animals attacked and defended themselves. But man had something greater than these, a developed brain, and therefore, greater brain power than other living beings. With this he was able to control the conditions in which he lived.

Foxes have holes, and birds nests, but man having no place to lay his head, built himself a bed. Bare hands and

naked feet could not take man far. He made for himself tools to help him, and when food was exhausted in one place, he moved to another.

New Stone Age Man

About half a million years ago manlike creatures walking erect, and wearing clothing of a sort moved through jungles, deserts, primaeval forests and plains in Africa, Western Asia and Europe. They used natural objects as tools—sticks, stones, etc.—as well as artificial weapons and tools. They lived in caves, in small groups, and were constantly on the move. There was only one form of transport, man's own feet. When all is said, this was an uncertain and precarious form of life.



Primitive man's transport—carrying and dragging

Animal Transport

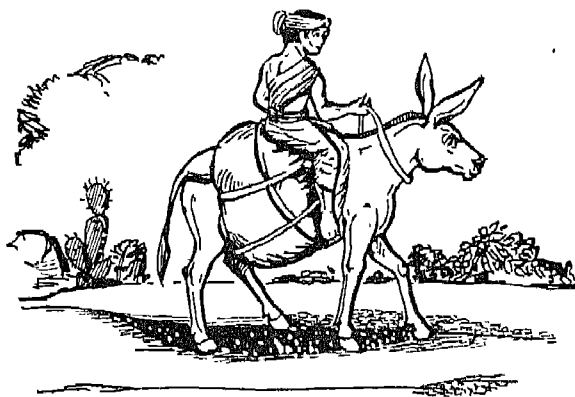
SETTING UP a fixed abode and family, man next turned to controlling his surroundings to be more certain of food. Somewhere between 7000 B.C. and 5000 B.C., he domesticated plants and animals. With these came an assured crop of grains and fruits, and a dependable supply of animals for food and clothing. He made baskets and pottery, and discovered firemaking.

A group of families made for a community. The march of man towards superior culture and civilization had begun in earnest. Settled communities, primitive farming and agriculture, and social organization—these came gradually into existence.

With a fixed abode, man used his feet to get to places where he found what he needed—water and fish from rivers, game in the forests, timber to make dug-outs. He carried what he could on his head or by hand. Small logs he could roll over on even or sloping surface. Animals he killed could be dragged by the horns or tied to the pole and carried by two persons.

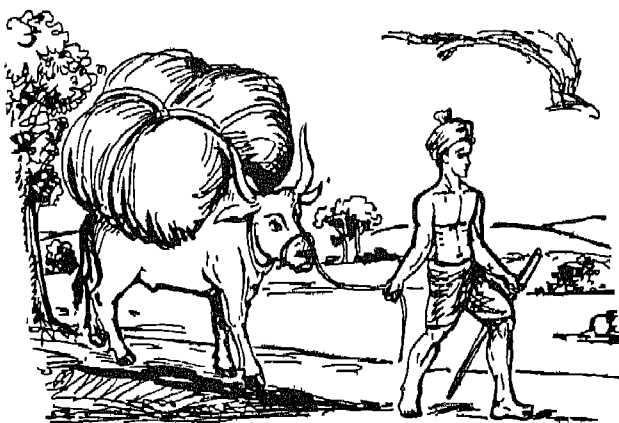
By about 7000 B.C. in the ice-covered regions of northern

Europe, the sledge with runners came into use, women pulling it with thongs of hide, the menfolk keeping their hands free for fighting. Man's (generally woman's) shoulders were the oldest means of transport. With the domestication of animals, man learnt to pack things on their backs. As the ox is not well adapted for this purpose, the ass was used and the ass seems to have been the oldest pack animal. Asses carried goods



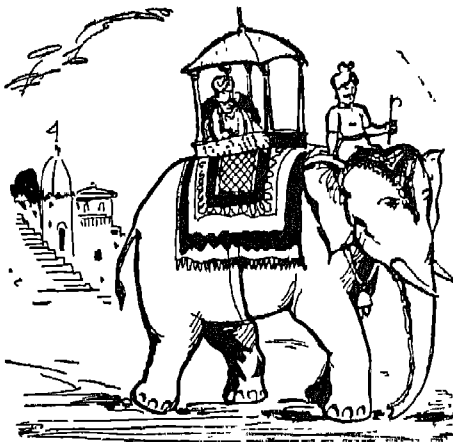
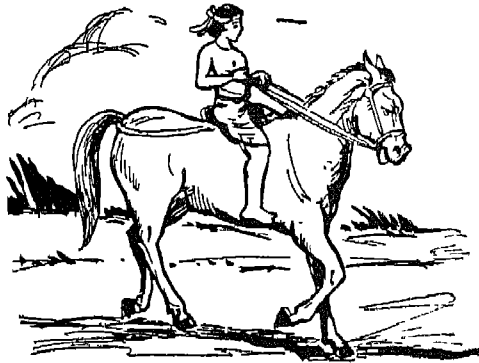
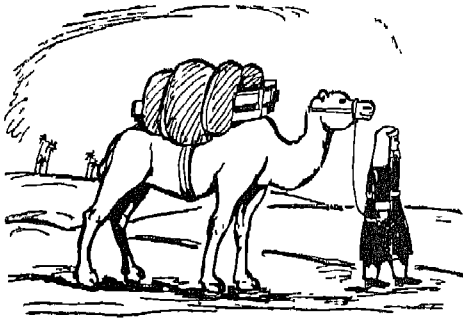
in Egypt in 3500 B.C. Their obstinacy was known even then. In a bas-relief on an Egyptian tomb is a picture of a man dragging the donkey by the front hoof and an ear, a second pushing it from behind and the third about to hit it with a stick.

Before long man learnt to ride donkey and later to use it to haul



Above— Domesticated donkey as carrier

Below— Domesticated bullock transport



ploughs and sledges. Bullocks were put to similar use in other countries. This was a very great step forward, because man was able to get a power greater than his own muscles could supply to do his work. The use of oxen and donkeys as pack animals rendered the carriage of goods vastly easier than before. If goods can be loaded on the beast's back, man can also sit there.

It is not known when horses first came into use. They are supposed to have been originally native in the steppes of Central Asia and Europe. The horse could provide, as it did for

Top—Domesticated camel as carrier
Middle—Domesticated horse for riding

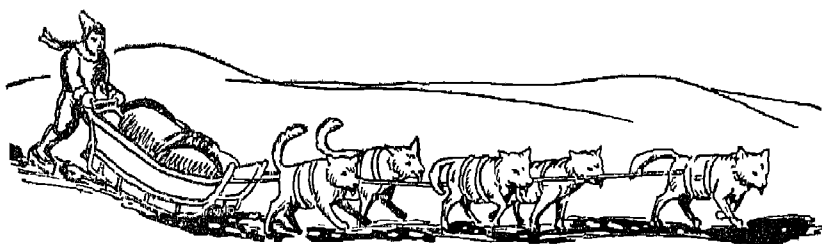
Bottom—Domesticated elephant carrying a person in the Howdah ; note the Mahout sitting in front

the peoples who lived in these areas—the Mongols and the Scythians—milk and meat. It could be used as pack animal, and for riding and driving. The domestication of horses also made possible greater speed and range of movement.

Camels and dromedaries were probably domesticated before 3000 B.C., and used for transport as well as for milk, meat, etc. They carry water in their stomach and can go through a journey in a desert for three days, doing 25 miles a day, without water. These animals, rightly called "Ships of the Desert," enabled man to conquer deserts which must have long remained as barriers between population groups.

The llama, a member of the Camel family and a native of Peru, was also domesticated. Its meat was extensively eaten, and the llama was used as pack animal. This has continued to our day.

American Indians had similarly used dogs to drag their dog-trains for transporting their belongings. Other animals had also been domesticated according to their natural distribution and used for food and as pack animals. The reindeer in the northerly parts of Europe and Asia must have been



Dog sleighs in the arctic and semi-arctic regions

domesticated from a remote period, and the Laplanders used them as beasts of burden, as well as for milk, meat, clothing and tents. The reindeer can drag a sleigh weighing 300 lbs. one hundred miles a day over the snow.

In the tropics, semi-tropics and probably much later, elephants were similarly domesticated and used for carrying or moving heavy things.

Coming of Wheeled Vehicles

THE INVENTION of the wheeled vehicle was the next important step in man's progress. Man seems to have invented the wheel, more than five thousand years ago. This brought about a revolutionary change. Whether the wheel came out of the potter's wheel or as a separate invention is not known. Our knowledge about this is derived from the discoveries made by archaeologists from the remains of ancient peoples dug out from the earth in which they lie buried. Some light on the wheel is thrown by the Sumerians¹ who flourished in the Tigris-Euphrates valley between the fifth millenium B.C. to 2000 B.C. They have left evidence of two-wheeled carts and four-wheeled wagons. Knowledge of these new developments spread from the Sumerians to other countries. These remarkable people are also believed to have invented the chariot. The wheel is the most important invention in the chariot or wagon.

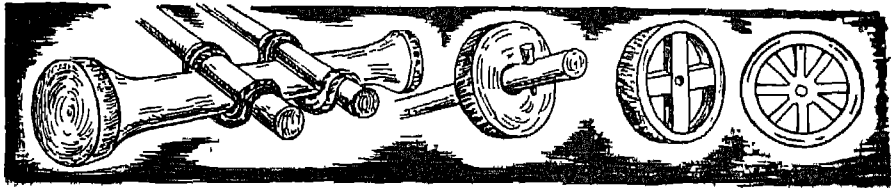
1. The Sumerians developed a great civilization in lower Mesopotamia between 3900 B.C and 3500 B.C, *Rise of the West*, William, H. McNeill p. 49,



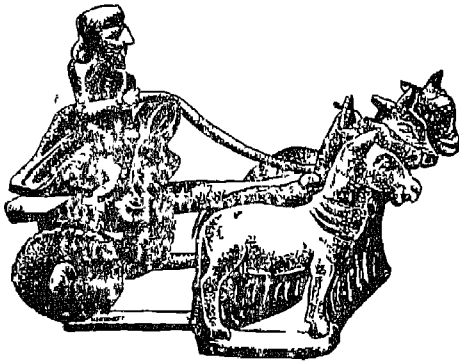
Heavy stone slabs dragged over logs

We have some information as to how they were made. Some details are to be traced in the Sumerian sculptures and actual specimens obtained from the tombs of the third millenium. Three solid pieces of wood were joined into one another and bound with leather tyres fixed with copper nails on the wheel. The wheels turned in one piece with the axle, and these were secured to the body of the sledge or carriage with leather thongs. The entire structure, though heavy and clumsy, made for a very great improvement on the human carrier or even the sledge transport.

Carts like these have survived the passage of many centuries and are still to be seen in use in Sardinia, Turkey and Sind. How important the use of oxen, horses, camels and asses had been to provide the drawing power to the wheeled vehicle is shown by the fact that this was essentially the

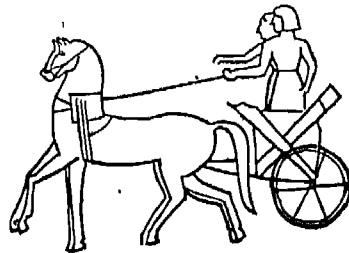
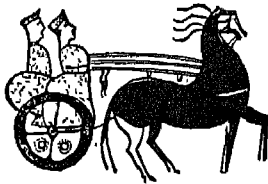
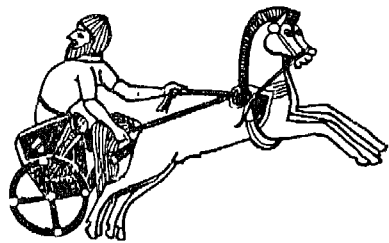


Development of wheels



Heavy Sumerian
ass-drawn chariot

An Aryan horse-drawn chariot



Chariots : fifteenth to thirteenth centuries B.C. from Egypt and Cyprus

form of overland transport from the fourth millennium to the nineteenth century.

Side by side with these developments in land transport also came others in regard to the means of crossing rivers and travelling over waterways.

Pre-Historic India

WE HAVE spoken so far about the chariots and carts and the animals drawing them as they were used in ancient times in the Middle East Empires. We may now turn to the conditions during about the same period in regard to transport in India.

The oldest Indian car of which there is a drawing is found among the paintings of the reign of Thothmes III (B.C. 1495)¹ in Egypt. According to one view, it was a present from a vanquished people of the name Rot-n-no, or Sanskrit *Rathinah*, "Charioteers".² This, however, is comparatively recent.

-
1. Thothmes (or Tethmosis) III was one of the four Kings of the same name, who belonged to the eighteenth dynasty. Besides fighting seventeen successful campaigns in Syria and twice capturing Kadesh, he proved a great builder and administrator.
 2. Henry Torrens, *Scope and Uses of Military Literature*, quoted by Rajindralal Mitra, in his *Antiquities of Orissa*, Vol. I, pp. 205. Another view ascribes this to the Rutens, a tribe who inhabited a country adjacent to Assyria.

We may try to peep into still earlier times. There is but scanty and scattered information of the Stone Age conditions in India. It is only on coming down to the Bronze Age that some details are available. But the information that we now have is from what has come to be known about the Indus Valley Civilization. The period of this civilization in its mature form is placed not earlier than 2500 B.C. Where written records are available the dates may be between 2300 to 2000 B.C.

The term "Indus Valley Civilization" is applied to denote the culture discovered from the Mohenjodaro and Harappan archaeological excavations. The findings from these excavations have given us an inkling into the life of a people whose existence was not suspected before. Their culture is now usually referred to as the Harappan Culture. From the oldest in the finds, the domesticated animals in the remote Harappan age appear to have included the Indian bull, the buffalo, the camel, the ass, the horse and the elephant.

There was undoubtedly trade within the Indus Valley Kingdoms. The evidence of use of copper, lead and decorative materials, such as chank shells, agates, carnelians and onyx, widely distributed in the region, shows that these articles must have been carried from their places of occurrence to the places where the Indus Valley craftsmen plied their respective trades. There was also considerable volume of commerce between the Indus Valley and the countries in the Persian Gulf and Sumer. The existence of a large merchant class, their caravans moving along well-known trade routes, use of camels and pack horses has been surmised from

the archaeological discoveries.³ The people who had developed trade on these routes would not have omitted to use flocks of long-haired goats to carry small packages, as these animals still do, to carry rock salt over the passes from Ladakh to India.⁴

Trade with Sumer must have been of great importance. According to Stuart Pigott "Harappan traders acquired a business which was already flourishing by about 2300 B.C.," using their characteristic seals on merchandise and documents.⁵ There was sea-borne trade up the Persian Gulf and the ports at the mouth of the Indus serving as inlets or outlets for merchandise.

3. "Under the jejune archaeological nomenclature of the 'Harappan Culture' there lies concealed one of the greatest nameless Kingdoms of Western Asia", states Stuart Pigott in his *Pre-Historic India*, p 133.

4. *Pre-Historic India*, Pigott, pp. 175-6.

5. *Ibid*, p. 210.

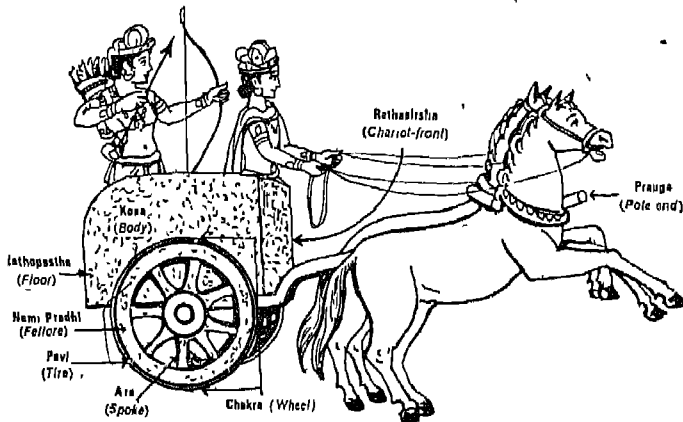
Rig Vedic Times

FROM ANOTHER source we obtain a remarkably clear insight into some details of vehicles of transport, namely, the Vedic literature. The most ancient part of it is the Rig Veda. The antiquity of the Rig Veda has been differently placed, some making it as recent as 1500 B.C. and others placing it very much earlier. References in the hymns indicate that the ox was one of the important pack animals of the Aryans who were settling in the Punjab.

Apart from other cattle the real characteristic domesticated animal of the Aryans appears to have been the horse. Horses were used both as draught animal and in war chariots. Riding seems to have been exceptional, probably because of the rather late development of the harness and the stirrup. The development of chariots drawn by horses was largely due to its important uses in warfare. Ox-drawn fourwheeled carts were used for farm work.

The chariot referred to in the Rig Veda as *Ratha* has been identified as the Indo-European wheel. It is similar to the Latin *roza*, Celtic *roth*, Old Higher German *rad* and Lithuanian *ratas*. The detailed description of the different parts

that went to make chariot or *ratha* is indeed given in remarkable detail. The body of the chariot was called *kosa* the material of which is surmised to have been wicker work or perhaps leather and light wooden framework. The axle was attached to the wooden floor of the chariot, apparently by leather straps, and projecting free of the chariot body on each side it carried the wheel secured by lynch-pins on the outer faces. The wheel had spokes.



Chariot in Rig Vedic times

The horse was harnessed to a single central pole rising in a curve, as shown by known representations, from the bottom of the chariot, and then continued to meet the yoke horizontally. Two horses were usually employed but an additional horse or two could on occasions be harnessed outside.

Some of the references in the Rig Veda are quite specific, pointed and suggestive : "Come Asvins with your three-

columned triangular car" runs an appeal. This has reference to the three shafts to each chariot in a triangular form. The number of spokes to each wheel was originally five, but later increased to sixteen. There was space only for two persons to stand or sit side by side. Chariots with greater carrying capacity are referred to in the Rig Veda : "Showerer of benefits, harness the car which has three benches, three wheels, and is as quick as thought; with which, embellished with three metals, you come to the dwelling of the pious worshipper, and in which you travel like a bird with wings" (II.184) ; "With that chariot, lords of men, which is your vehicle, which has three benches, is laden with wealth," c (IV.153) ; "Conduct here, Asvins, your radiating wealth-laden chariot" (IV.153); "Agni kindled into flame, come to our presence in the same chariot with Indra, and with the swift gods" (II.331).

The Ramayana mentions the cars used by Kings and great warriors were embellished, befitting the rank of the owners, with gold, silver and copper.

While chariots drawn by horses were used by the Kings and warriors of the times, the humbler folk had to have their needs met by a less spectacular form of transport. There is mention in the Rig Veda of the wagons drawn by a team of which one was a bull and the other a buffalo. Wagons were, when occasion demanded, drawn by more than a pair of animals.

The war chariot of the Aryans in India appears to have been essentially the same vehicle known in the Mohenjodaro and Harappa and other areas of Harappan culture

in Greece and Celtic Britain. The technique of the coach-builders and wheelwrights in the entire intervening area between Britain and India appears to have been substantially the same over a period of a thousand years.

For further developments of inland transport, we must come down to the Iron Age and, particularly, the Mauryan era. By this time we begin to observe some of the conditions which had given rise to sophisticated and specialized forms of urban and cross-country travel.

We have so far confined our attention to transport over land. Transport over water in a sense afforded far greater stimulus and a sense of power to Early Men. Before proceeding further with the developments since the commencement of the Iron age we may look back to see how Man established his conquest over the waters.

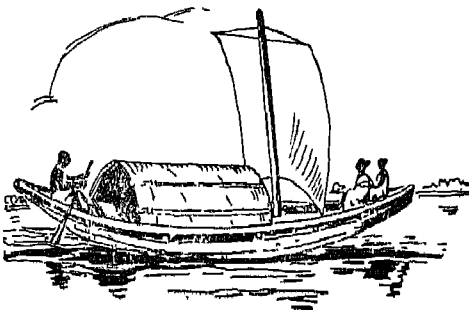
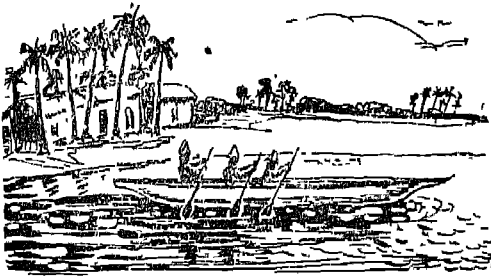
Crossing the Seas

EVEN THE most primitive of peoples had to cross rivers, lakes, and even oceans. Such islands as Crete and Cyprus, Sicily and Sardinia, Ceylon and the Malay Archipelego could not have received their earliest inhabitants without the assistance of some means of travelling over the sea.

No one can say precisely how this came about. It seems reasonable to assume that early man used the materials available in order to help him to travel on rivers and lakes and by sea. It might have been a solid log which on being floated could carry the primitive man down or across a river.



Early man crossing water on logs



The log was later superseded by logs hollowed out to make it stand the passage through sea better. This became the dug-out canoe.

Dug-out canoes have been used by aboriginal people in many widely separated countries, such as North Australia, North America and Malaysia. There is evidence of the use of dug-out canoes by primitive peoples in Europe about 1500 B.C. and in the marshes and river beds in Britain. The term itself was the local name in the West Indies to describe any long and narrow boat.

Top—Rafts with logs tied together, transport on inflated skins across water

Middle-above—Catamaran out at sea

Middle-below—Dug-outs

Bottom—Sailing boat

The dug-out canoe is one of the most ancient devices of man to travel on water and its use has survived to this day in such scattered places as the White Nile, West African Coast, the shores of the Indian Ocean, the Pacific Islands, the Pacific coast of Asia, the adjoining north-western coast of America, and the South American continent.

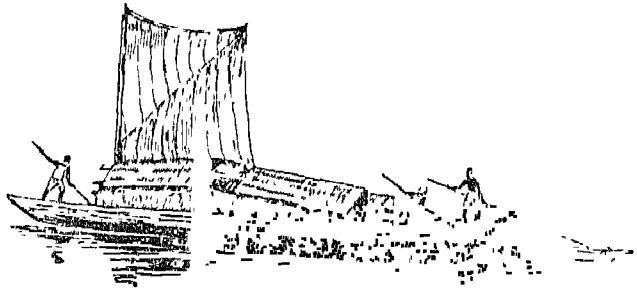
How the dug-outs were actually hollowed out is not known. Columbus had seen fire used in the West Indies for this purpose. Another method appears to have been by softening the wood with boiling water, and scooping out with the adzes of shell or stone. What is of special interest to be observed here is that identical methods have been used for the hollowing-out process in places as far apart as Burma and British Columbia.

Another means of water transport is the use of the raft-logs tied together. The ancient Babylonian *kedleka* were built of several layers of timber, the buoyancy being improved by the use of inflated skins. This has been seen in use down to comparatively recent times in Baghdad. Built in the northern country, then loaded with merchandise, they were steered down the Euphrates. On reaching the destination, the rafts were dismantled, the timber was sold, and the skins were deflated and put on back of asses brought in with the raft, and the raft men returned by way of road.

Rafts equipped with inflated skins have been quite common in upper India not very long ago. A similar contrivance has been in use in Indonesia, the north-west coast of Australia and the Pacific islands.

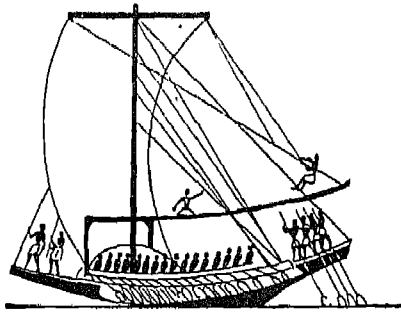
Another type common in Asia is the wooden raft, *Jangada*, widely distributed on the riverways of the Asiatic

The *Jungahu* of Asiatic origin, found plying far away in the Pacific coast of South America



interior as well as in the Pacific and South American coasts.

The reed canoe dates back to quite ancient times. It is the same as the Memphite bark described by Isaiah in the Old Testament, and also found in widely scattered areas. This seems to have influenced the "Graceful Egyptian Vessels" of the Old Kingdom.



Graceful sailing boat in Ancient Egypt,
taken from a mural

The development of the ship more than five thousand years ago has been ascribed to the Reed Float, the Egyptian *baris*. The *baris* is a canoe of distinctive design made of water plants or osiers bound together with bands of stalks

of the common papyrus. The middle of the boat had sufficient width and bulk and the ends were tapered and pointed.

The interesting feature about the Reed Float is that they have survived through many centuries to the present day. What is even more remarkable is that there are features common in the floats found in the rivers of the South and Western Australia, on the west coast of Tasmania, on the Lake Tsana, in the south western Sahara, in Iran on Lake Hamun, in California used by the Seri Indians and in Peru. How old these floats were is indicated by the appearance of the Egyptian type in Mesopotamia several centuries before the Christian Era.

These details point to Man's early navigational attempts and the resultant spread of culture. This came about during the Bronze Age.¹ The spread of Neolithic² agriculture and village life had developed to a stage when a forward step could be taken.

We have glimpses of the sea-faring activities of our people during the Mohenjodaro and the Rig Vedic times. The recent excavations at Lothal contain the remains of a large settlement of the Harappan age at the head of the Gulf of Cambay. The existence of a port with a large dock for handling cargo and ships has been discovered. Close to this

1. Bronze axes and knives became the tools in the Bronze Age as contrasted with the earlier Stone Age.
2. The Neolithic (New Stone) Age is applied to the stage of man's culture in which men controlled their own food supply by cultivating plants and breeding animals. This is distinguished from the Palaeolithic (Old Stone) Age in which man subsisted on hunting, fishing, gathering berries, roots, etc. The term "Stone" refers to stone implements, these being better in the Neolithic than in the Palaeolithic age.



Boat in Mohenjodaro Seal, 3000 B C.

are the remains of a town with all civic amenities known to that age and the requirements of a busy centre of international commerce. A flourishing trade must have been carried on with Sumer with the exports of the products of goldsmiths of unexcelled craftsmanship, coppersmiths and shell-workers besides the locally grown cotton, rice and wheat. From the objects collected from the excavations, imports into Lothal must have included copper, ivory, shell objects and stone beads.

The dock is deemed by modern port experts a remarkable example of skilled engineering. It is probably the earliest example of an artificial enclosure for handling cargo and berthingships. It had built into it different arrangements to prevent the effect of tidal waters and to secure automatic desilting and water-locking. Obviously, Lothal must have been the international meeting ground of merchants from different parts of Asia, Persian Gulf and Eastern Mediterranean.

There are many references to sea-faring activities of ancient Indians in the Vedic times. The Rig Veda mentions

about Varuna "who knows the path of the birds flying through the air, he, abiding in the ocean, knows also the course of ships", all men who went "to the ocean eager for gain" ; "how the Asvins rescued Bhujyu in the ocean with a ship of hundred oars". In a beautifully expressive phrase the Maruts, the winds, are said "to toss the clouds like ships". There are references to "eastern and western oceans."

In the post-Rig Vedic period, the Vedic texts speak more frequently of the sea and there is mention of "the sea encircling the earth". The *Ramayana* speaks of merchants who traded beyond the sea and brought presents to the King. In the *Mahabharata* a large boat is mentioned which, being equipped with machinery, could defy the hurricane while sailing on a river.

These references, though somewhat patchy, are sufficiently explicit to indicate the familiarity of these ancient people with the sea for the purpose of trade and travel.

What was trade like in these times ? The answer depends on the character of the activities of the people, their occupations, their industries, the materials required for these, the places from which they were brought, in cases where they were not locally available, the general standards of life, etc. We can learn something about these from the information available relating to the Bronze Age,

The Bronze Age

THE REAL advance towards organized transport is to be traced in the Bronze Age. What did the Bronze Age signify? Although its features varied according to the regions in which it flourished, there were distinctive elements common to all. Man had emerged from the uncertainties of life caused by the vagaries of nature. He had begun to show some forethought in order to escape from the effects of these. Improved forms of cultivation produced from land more corn and grain; fishing in waters made for supplementary food. The grain left over after current needs was stored in the community, village or city granaries. This store of grain could be drawn upon in the event of failure of crops in the next season. There was some protection against starvation from lack of food, as food could be moved by waterways and roads to the places affected by failure of crops.

Population increased. The general style of life also improved. There was more variety of food and drink, better shelter, and clothing. There were exchanges of goods between regions at a distance. Luxury goods of small bulk

which had an appeal to the small, better placed families with more means than others in the community were carried by land or sea transport and supplied to them. A Stone Age man could never have had the comforts and abundance of the Bronze Age man.

The Bronze Age civilizations flourished in the alluvial valleys of the Near East in Egypt and India till nearly 1200 B.C. The archaeological and other remains have left enough material in these countries to know how life was organized during this period. About 1800 B.C. the heavy solid wheels of chariots were replaced by spoked wheels and swift horses replaced the slow moving asses of earlier times as tractive power. These improvements helped to enhance the political authority of the Babylonian monarchs and speeded up communication within the Empire.

What changes these developments meant are readily indicated. A caravan in the Syrian Steppes moved over a distance of 30 miles a day. A light horse-drawn chariot vastly reduced the journey time. It was quite costly in terms of the materials used and the skilled labour that went into the making of the chariot: special woods imported from outside, and made by skilled wainwrights. Such chariots were mainly used by soldiers and officials of State or war chiefs like Homer's heroes. The influence of better and speedy transport in the second millenium is seen in the comparative political stability of the Assyrian, Egyptian and Hittite Empires.

Use of horses as draught animals was further improved by the techniques of carpentry and leather work, spoked wheels, pierced hubs, and appropriate harness. The army could more quickly move to maintain peace and keep back

invaders. The light two-wheeled chariots became a decisive factor in the battlefield. Similarly officials of State could also proceed equally quickly to different parts of the country and help towards better government.

Seafaring quickened the pace of activity more than any other single factor. The quieter waters of the Mediterranean were traversed by sailors as early as 4000 B C. Ships from Sumer about this time sailed through the Persian Gulf to Arabia and into the Red Sea to make contact with the ancient Egyptians. The sailors who made these voyages could equally well have gone to the Indus Valley.

Timber and olive oil from Crete must have led to trade by sea. Around Malla also grew up similar maritime activity.

Trade, Towns and Ports

AT SOME stage, a market economy must have come up, simple artisans and peasants trading between themselves what they produced. In the bigger towns, similar exchange occurred between artisans and traders, and in more important centres merchants traded with other towns and with other countries.

During the Bronze Age, transport had developed to greater ubiquity as well as efficiency. On the developed form of transport in this period archaeology affords enough evidence. When traders and goods move between different places many times in the year, trade routes come into being. This gave rise to some convenient places being used for the collection of cargo and freight. There is evidence that as early as 2500 B.C., merchants at Kanis on the plateau of Asia Minor acquired some importance for the export of copper, silver and lead from Turkish mines.¹ Byblos was another place which was visited by ships of the Pharaohs for obtaining cedars of Lebanon. They also sent expeditions to Sinai for copper.

1. *Man Makes Himself*, Childe, V. Gordon, p. 149,

Yet another Bronze Age civilization giving rise to populous cities and skilled industries flourished in the Indus Valley. The river system here provided the means of getting articles of necessity from long distances. Carts with solid wheels as well as boats helped to bring produce and raw materials for industries. Tin, gold, precious stones and lapis lazuli came to Mohenjodaro from outside.

Many towns began to flourish, particularly those with access to the sea, and these became part of the chain of maritime trade. Babylon was the greatest metropolis in the Middle East. There were, besides, Ashur, Nineveh, Damascus in Syria, Carchemish in Upper Euphrates, Susa in the south east, Sardis, capital of Lydia, Memphis at the apex of the Delta, Thebes in upper Egypt and Naucratis; Tyre and Sidon in Phoenicia coming next. The southern seas, uniting Egypt, Mesopotamia and India continued to be traversed by merchant vessels during the second and the first millenium B.C'.

Over land trade routes also grew in importance and in greater use. The introduction of camels facilitated commerce between Egypt and Mesopotamia, increasing as time went on in volume and frequency.

The Iron Age Revolution

THE IRON Age succeeded the Bronze Age by about 1000 B.C. and brought about a great revolution in the life of the people. The use of bronze was limited because of the scarcity of the metals. But iron was more abundant, and with the knowledge gradually built up of efficient and economic working, this could give man more tools and superior tools for his work. This was seen in the use of iron axe to clear new land, of iron ploughshares to break hard virgin soil, and of iron weapons to defend against enemies or the invader. Trade extended to the countries which had iron ore and iron-made things to sell.

The Iron Age also saw a great expansion in man's ideas, knowledge of arts, and growth of efficient government. This proceeded on the foundations laid by the impact of the great civilizations of Mesopotamia, Egypt and India in the Bronze Age on neighbouring parts of Eurasia. The impact was considerable as there were movements of peoples and of goods between these countries in an ever-increasing volume.

Places with easy access to sea or water transport were in a special position of advantage. They produced what

was natural to them. They could export what was surplus to the needs of the local people and obtain in exchange what could not be produced locally.

Ships now became larger. It is mentioned that Hiero of Syracuse built a 4200-ton ship. Seamen began to sail direct instead of hugging the coast. By keeping to the coast, voyages took more time, and there were risks of piracy.

A new era in navigation came with the installation of lighthouses. Under Alexander was inaugurated, by Pharos of Alexandria, a 480-ft. high tower and in the lantern was burnt resinous wood. In Alexandria the Romans contributed other improvements, such as hydraulic cement, coffer dam, and pile-driving in deep water.

Voyages consumed considerable time. Journeys from the Indus region to Seleucia on the Tigris took 40 days. From Berenice on the Egyptian coast in the Red Sea to Peninsular India—a distance of 2760 miles—the voyage might take five to six months.

The articles of trade were mostly luxuries, and these were quite numerous and drawn from distant lands. They consisted of Greek pottery, Arabian frankincense, perfumes, spices, drugs, ivory, jewels from Central Asia, Arabia and India; gold, furs or forest products from Siberia and Central Russia; amber from the Baltic; metals from the British Isles, particularly Cornish tin, and tin from Spain.

Land transport also improved after the commencement of the Iron Age. Politically more stable governments contributed to security as well as convenience of movement. Caravan routes in Asia were policed and equipped with post stations. Romans were great road builders and Roman

influence helped to improve the roads further. In fact, it was said that the roads from Rome were so graded that a wagon could easily take the load of a barge. After 114 B.C., a dozen caravans a year carrying silks crossed the deserts of Central Asia from China to Russian Turkistan, and the stuffs were then sent to Seleucia, Antioch, Alexandria, and Rome. A citizen of Rhodes or Alexandria was familiar with elephants, monkeys, parrots, cotton, silk, tortoise shell, furs, myrrh, pepper, ebony, coral, amber and lapis lazuli.

Mauryan Times

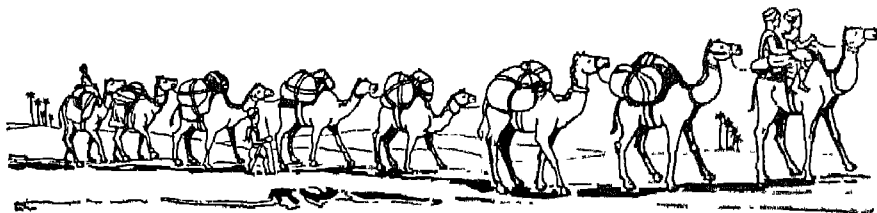
EVIDENCE OF sea-faring and trade activities of Indian merchants is found in the archaeological evidence of apes and Indian elephants on the obelisk of Shalmaneser III (860 B.C.), and the presence of logs of Indian teak in the Moon Temple at Mugheir and in the palace of Nebuchadnezzar (both sixth century B.C.). The invasion of Alexander opened up communication between Greece and India and the Greeks who accompanied him had opportunities of observing possibilities of trading and other activities between the two. Coming down to the Mauryan times, after the invasion of Alexander the Empire extended to its outermost limits. Greek writers also make mention of the conditions of life in India, the state of transport, travel habits, etc.

Megasthenes, the Greek Ambassador at the Court of Pataliputra, has given us some interesting details. The Royal Road from the North-West Frontier to Pataliputra had a length of 10,000 *stades* or about 1,150 miles. Megasthenes must have travelled down this road before joining his duties at the Court of the Mauryan Emperor. Every mile of this road was marked by a stone indicating the byroads and

distances. According to Pliny, another Greek writer, there were officers responsible for its upkeep and repairs and for the erection of milestones and sign-posts at every 10 *stades*. Inland trade was carried on by carts and caravans.

According to Kautilya, the author of the extraordinarily interesting book on government in the Mauryan times, there were the Raja-marga, (the King's Highway), the Rashtrapatha (the State road) and paths for animals, paths for asses and camels, cart tracks, foot-paths, pasture-paths, shop-paths, defile-paths, cremation-paths, etc.

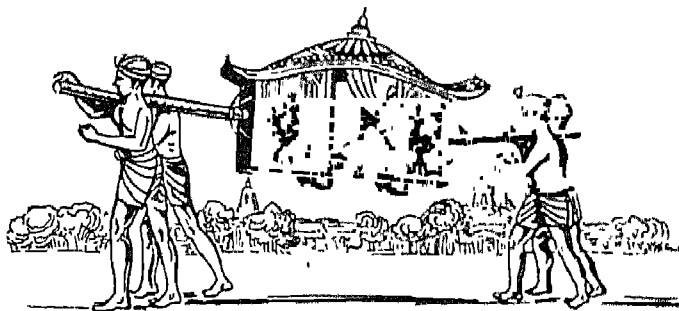
Our knowledge of the principal routes is derived from old Pali texts. There is an account of the caravan of a merchant Prince Anathapindika who was proceeding south-east from Sravasti to Rajagriha, and he passed along the foot of the hills of Kushinara. Caravans travelled overland towards east and west, and across deserts, requiring days to cross and steering in the cool nights by the stars. The trunk road proceeded from Rajagriha, then Varanasi, Sakata Sravasti, towards Taxila and the frontiers linking India with Central and Western Asia. The better class of roads had milestones to indicate distance, and amenities by the roadside, shady trees, rest houses, wells, etc. Kautilya mentions of passes to be produced when crossing boundaries.



Camel caravans in Mauryan times

Caravan traffic was carried on by a cooperative organisation of different merchants with their carts loaded with goods. These were placed under a common Captain, called *Satthavaha*, who regulated the movements, stopping at halts, watering routes, fording, and keeping away from danger spots. They also had the services of another person, a land pilot, called *Thala-niyamaka*, who helped the caravans to avoid the dangers and difficulties of travel—"drought, famine, wild beasts, robbers and demons." There were two more east-west routes— one from *Sravasti* south-west to *Paithan* and another westwards to *Sind* and *Sauvira* and its ports. The caravans travelled both east and west and across deserts.

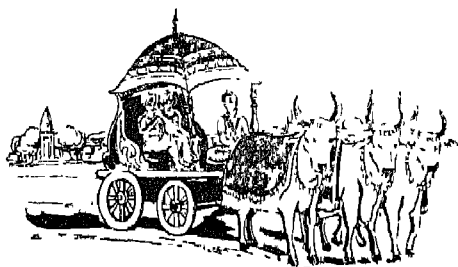
Travel by sea had become much more familiar and common. Sea-borne and river-borne traffic had increased as compared with the earlier times. Among the accounts of the times there is a reference to the traders of *Varanasi* who took joint action in fixing freight charges when hiring a common vessel. Ships and boats, both large and small, were used for navigation. Rivers were crossed by either boats, or rafts of wood or basket work. Government had boats or ships on hire, and took steps to stop and destroy piracy. Among the maritime accounts there is mention of the Prince *Mahajanaka* sailing from *Chamba* (*Annam*) to *Swarnabhumi*, of passengers safely brought from the sea by river up to *Banaras*, of traders coasting around India from *Bharukachchha* on the west to *Swarnabhumi* in the east touching, during the voyage, a port in *Ceylon*. The cargo brought by a newly arrived ship at the landing place was, it is stated, bought up at the landing place itself by a hundred waiting and competing merchants. Some of the ships were



Well-to-do people carried in litter (Palki), Megasthenes' times
large enough to carry 500 and 700 passengers.

In the capital city and towns, which were, Megasthenes says, too many to count, the better class people moved about using litter, sedan chair, four-chaired horse-carriage and carts drawn by two cows and a bull between or two bulls and a cow between. The very rich rode on elephant and the animals used by ordinary people were camels, horses and asses. Next to the elephant, the chariot and carriage for four ranked the highest. The camel came next. The use of a single horse was no distinction at all.

The cultural and religious missionaries of this country who were specially active during the reign of Asoka improved



Four-wheeled passenger carts
drawn by bullocks

the relations already established by the traders. Travel was by no means without difficulties. An interesting account of the risks and troubles facing the merchants is contained in the story of Sanudasa in the Buddhist text *Niddessa*. Sanudasa joined the party of the adventurer, Achera, to go to Swarnabhumi (the land of gold). They crossed the sea and land and the foot of a mountain. They climbed to the top by catching hold of creepers. This was called the Vetrathapa, (the Creeper's Path). They crossed a river on the plateau which changed into stone anything that fell into it, by holding on to the bamboos overhanging the banks. This was called the Vamsapatha (Bamboo Path). Proceeding further into a narrow path between precipices, they attracted by the smoke from burning some wet branches some Kirathas who sold them goats which were the only animals able to follow the narrow edge without feeling giddy. This was called the Ajapatha (Goat's Path). The troubles were not over. After a struggle with another party from the opposite direction, Achera's party passed through. Next the party killed the goats and put on skins inside turned out in order to attract huge birds which would mistake them as masses of fresh meat and carry them to the land of their nests. The bird carrying Sanudasa was attacked by another bird to steal the prey and in the struggle the skins bursting open, Sanudasa fell into a tank in the heart of a luxuriant forest. The next day he reached a river, the banks of which were of golden sand. From a hermitage nearby an anchorite came out.

The tale reads like one of Sindbad's travels in the Arabian Nights,

With the Periplus in the Erythraean Sea

WE HAVE had so far only some glimpses into the economic conditions and the state of transportation in India and the surrounding countries. By the time we come down to the early years of the Christian Era, some more details are available from such notes or accounts of foreign merchants or travellers that have come down to us. One of the most interesting accounts of this character is supplied by the *Periplus of the Erythraean Sea*.¹ Its date is about 60 A.D., and it contains a very detailed account of the trade of the Indian Ocean and of the principal ports on its shores.

Let us follow the voyage into the Indian Ocean with the *Periplus* and see what the voyagers then saw. The ship that sailed might have been somewhat similar to the Egyptian type used in the pre-Christian times. The modern Burma

1. *Periplus* was the name applied to the writings in Roman times meaning a sailing-chart and a travellers handbook. *Erythraean Sea* was the term used by Greek and Roman Geographers to the Indian Ocean including its adjuncts, the Red Sea and the Persian Gulf,

Trader affords an idea of the ship. The author used rather peculiar forms of names of places. The modern names are shown in brackets or in footnotes.

The best season to venture into the vast waters of the Arabian sea was fixed by the trade winds. A Greek merchant, Hippalus, discovered the favourable winds with the help of which a ship could sail right across the sea and return with the help of counter winds in winter. Before him the knowledge of these winds was a secret of the Arabs and Parthians who made the trade with India wholly their own. After Hippalus, this was no longer a secret and all could use the direct route and trade with Indian ports.

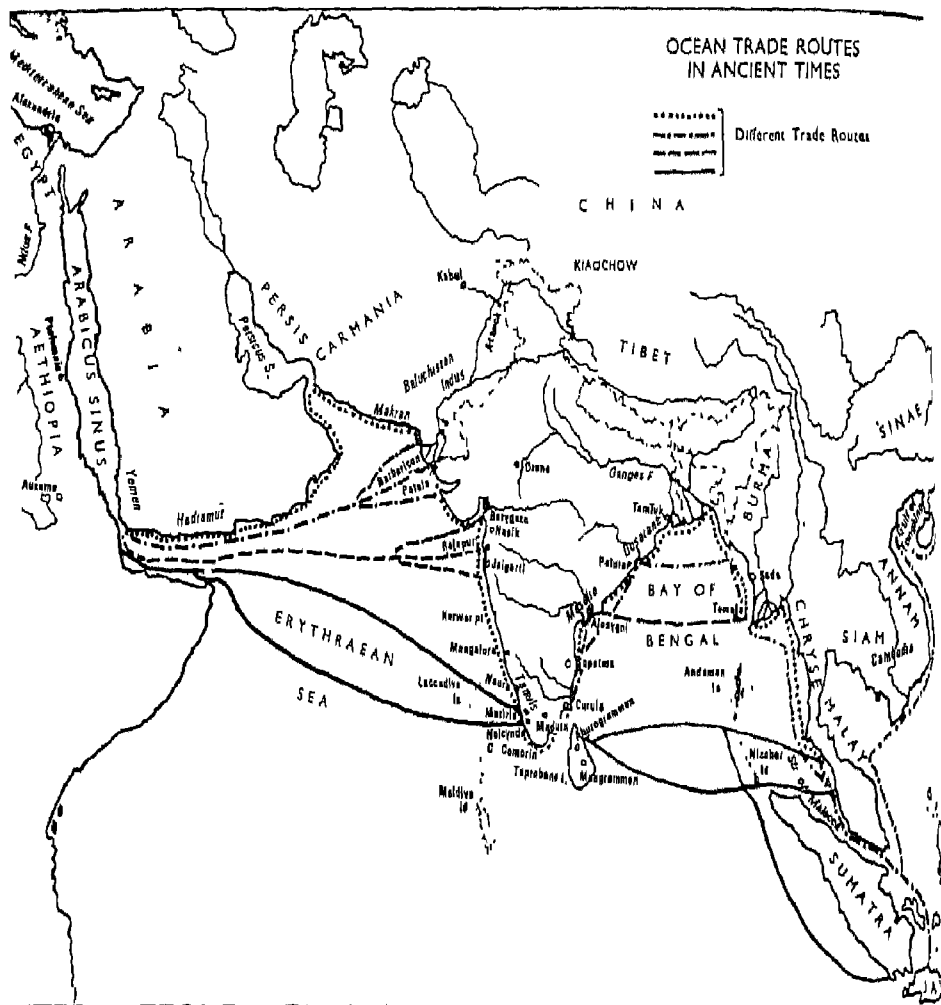
The voyage starts from the Mussel Harbour or Myos-Hormus² on the Red Sea, about six or seven days from Coptos³ on the Nile along the road through the desert. An ancient Greek geographer⁴ mentions camel drivers plying between the two famous towns, Coptos and Myos-Hormus. Sailing down from Hormus, the ship arrives at Berenice.⁵ From this port the ship sails and calls at a number of other ports and roadsteads, such as Ptolemais near the Nubian forests and centre of elephant trade, Adulis (the modern Massowa), Zoscales, Avolites (the modern Zeila), Malao (now Berbera), Mosyllum, Cape of Spices (Cape Guardafui), the promontory of Tabae and the market town of Opone (now Ras-Hafun). At these places are collected ivory chips coming from Ariaca across the sea (modern Kutch, Kathiawar and Gujarat) as well as

2. Now identified with Ras Abu Somer, 27° 12' N 35° 35' E.

3. Now Koft in the bend of the Nile.

4. Strabo, Circa 63 B.C.-25 A.D.

5. Identified with Unim-el Ketef Bay, below Ras Benas.



Indian iron and steel, Indian cotton cloth of several kinds, fine and inferior, girdles, and coats of skin and coloured lac, flint glass, juice of sour grapes, assorted dressed

cloth for Berbers, wheat, spices, tortoise-shell, sheets of soft copper, gold and silver coins, frankincense, harder cinnamon, Indian copal, *macir*⁶ and rarely slaves.

On reaching the Gulf of Aden, the ship may sail about 1,470 miles to the Indus. Overtaking it "the river Sinthus, the greatest of all rivers that flow into the Erythraean Sea, bringing down an enormous volume of water so that a long way out at sea, before reaching this country, the water of the ocean is fresh from it." From the middle of the seven mouths of the Indus the ship can go to the market town of Barbaricon⁷ by the shore; and behind it inland is Minnagara.⁸ The ship lies at anchor at Barbaricon and the cargo, carried by river to the King at the metropolis consists of a great deal of thin clothing and a little spurious clothing, figured (embroidered) linens, topaz, coral, storax, frankincense, vessels of glass, silver, gold plates, and a little wine. It takes in exchange from this port a number of forest products—bdellium resin, lycium, nard, root from costus (from Kashmere used for cooking and as perfume) turquoise (precious stone), lapis lazuli, furs, cotton cloth, silk yarn and indigo.

The ship now weighs anchor and crosses the gulf of Eirinon (the Rann of Kutch), shallow and dangerous, and further on another gulf of Baraca (Dwarka) which also sailors avoid by keeping out at sea. The coast here is that of Ariaca called Synastrene (Saurashtra), and the fertile country which

6. A red bark from India used as remedy for dysentery.

7. A Greek form of an Indian name, possibly Bahardipur which survives in the modern Delta.

8. Variouslly identified with Indore, the ancient town of Madhyamika or Nagari near Chitor, and a place in Kathiawar.

produced "wheat and rice and sesame oil and clarified butter, cotton and Indian cloths . . . of the coarser sorts."

The next point of call, crossing the Gulf of Cambay, is the famous Barygaza (Broach, known in ancient times at Brigukachha or Bharuguchha). Coming to Barygaza from the ocean is "very difficult to navigate" because right at the north of the gulf is a long and narrow shoal, full of rocks. The local fishermen in the King's service are stationed at the very entrance of the river at Barygaza, with well-manned large boats, called *trappaga* and *coymba* (types of fishing boats), as pilot vessels going up as far as Saurashtra. The inrush of tidal waters makes it very dangerous to the inexperienced to go up to the market town of Barygaza, and anchors cannot hold up against it. The people of the country inland are the Arattii (in the Punjab), the Arachosii (in Kandahar), the Gandaraci (Peshawar District) and Poclais (Pushkaravati or Pushkalavati, the modern Charsadda). Inland is the famous city and former Royal Capital of Ozene (the modern Ujjain) from which came agate and carnelian, Indian muslins and cloth; c. stus and bdellium, spikenard (a Himalayan herb for essential oil for medicinal purposes).

The ship brings to Barygaza many articles from the west: wine, Italian preferably, also Loadician and Arabian, copper, tin, lead, coral and topaz; thin and inferior clothing; bright coloured girdles, a cubit wide; storax, sweet clover, flint glass, realgar, antimony, gold and silver coin, and some ointment. For the King, whose favour and protection are most important, "very costly vessels of silver, singing boys, beautiful maidens for the harem, fine wines, thin clothing of the finest weaves, and the choicest ointments." The ship got

in exchange to carry to Egypt in addition to those already mentioned, long pepper (*pippili*)

The ship proceeds south, along the coast which extends in a straight line from north along the region called by Periplus Dachinabades (*Dakshinapathas*). Towards the east from the coast in the inland country are "many desert regions and great mountains, all kinds of wild beasts—leopards, tigers, elephants, enormous serpents, hyenas, and baboons of many sorts; many populous nations, as far as the Ganges."

The length of the coast to the end of Damarica (land of the Tamils) is 7,000 *stadia*. The market towns which the foreign trader would visit, after Barygaza, are Suppara (Sopana a few miles north of Bombay) and Calliena (the modern Kalyan), the main port for the Andhra Kingdom when the western coast was part of it. Other market towns beyond Calliena in this region are Semylla (modern Chaul 25 miles south of Bombay), Mandagora (probably the modern Bankot, at the mouth of the Savitri River, in former times a great centre for trade in teak and blackwood and for ship-building), Palaepatmae (Dabhol, the principal port of South Konkan), Melizigara (Jaigarh, still frequented by Arab boats), Byzantion (a corruption for possibly Vijayadurga, a good harbour), Togarum (Devgarh probably) and Auranno-boas (Malvan harbour, a contraction for Matralavana).

Next the ship comes to the islands of Sesecrienae (Vengurla Rocks), Aegidioi (Island of Goa), and Caenitae (Oysters Rocks) opposite Chersonesus (peninsula in Greek, the projecting point at the modern Karwar). Sailors in these waters must bear in mind the Periplus's warning about pirates. Further on is the White Island (Pigeon Island, also called Nitran).

The ship is now approaching Danirica, the first markets being Naura (Cannanore) and Tyndis (Ponnani) in the Kingdom of Cerobothra (Cheraputra or Keralaputra). Next is Muziris (modern Crangannore or Kodungallur) famous in the ancient world as an important seaport and meeting place of sailors from the East and West. It "abounds in ships sent there with cargoes from Arabia and by the Greeks."

Further south are Nelcynda (in the Cochin backwaters near Kottayam) in the Kingdom of the Pandian and Bacare (Porakad). In all these ports of Damarike, the imports are mostly those referred to earlier. Large ships come to these ports because of the great quantity and bulk of pepper and malabathrum,⁹ Pepper from Cottanara (Kolathunadu in north Malabar), great quantities of fine pearls, ivory, silk cloth, spikenard from the Ganges, transparent stones,¹⁰ diamonds and sapphires, and tortoise-shell are among the articles exported from these ports.

The whole voyage from the Red Sea ports prior to Hipalus' discovery of the trade winds, about 45 A.D. used to be made in small vessels by sailing close to the gulfs.

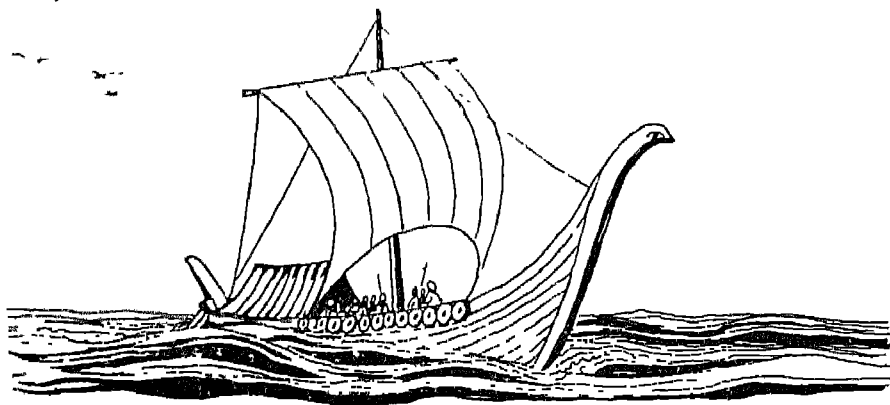
The ship of the Periplus might have been one of a fleet of a hundred and twenty vessels which every year about the time of the Summer solstice (22 June) sailed from Myos-Hormos on the Red Sea. They traversed, by the periodical assistance of the monsoons, in forty days. The coast of

9. Believed to be a kind of cinnamon leaf, one of two treasured ingredients of ointments and perfumes in the Roman Empire; the other was spikenard.

10. Beryls from Coimbatore District.

Malabar, or the island of Ceylon, was the usual termination of their navigation.¹¹

It is in these markets that merchants from the remote countries of Asia waited for these ships from the West to come. After discharging their cargo and taking in exchange the products from these ports the Egyptian fleet prepared to return in the months of December or January. The cargo was transferred to the backs of camels from the Red Sea to the Nile, and after descending that river to Alexandria, was poured without delay into the Capital of the Roman Empire, Rome. Gibbon,¹² the great English historian,



Sailing boat traversing high seas in search of cargoes from India and beyond

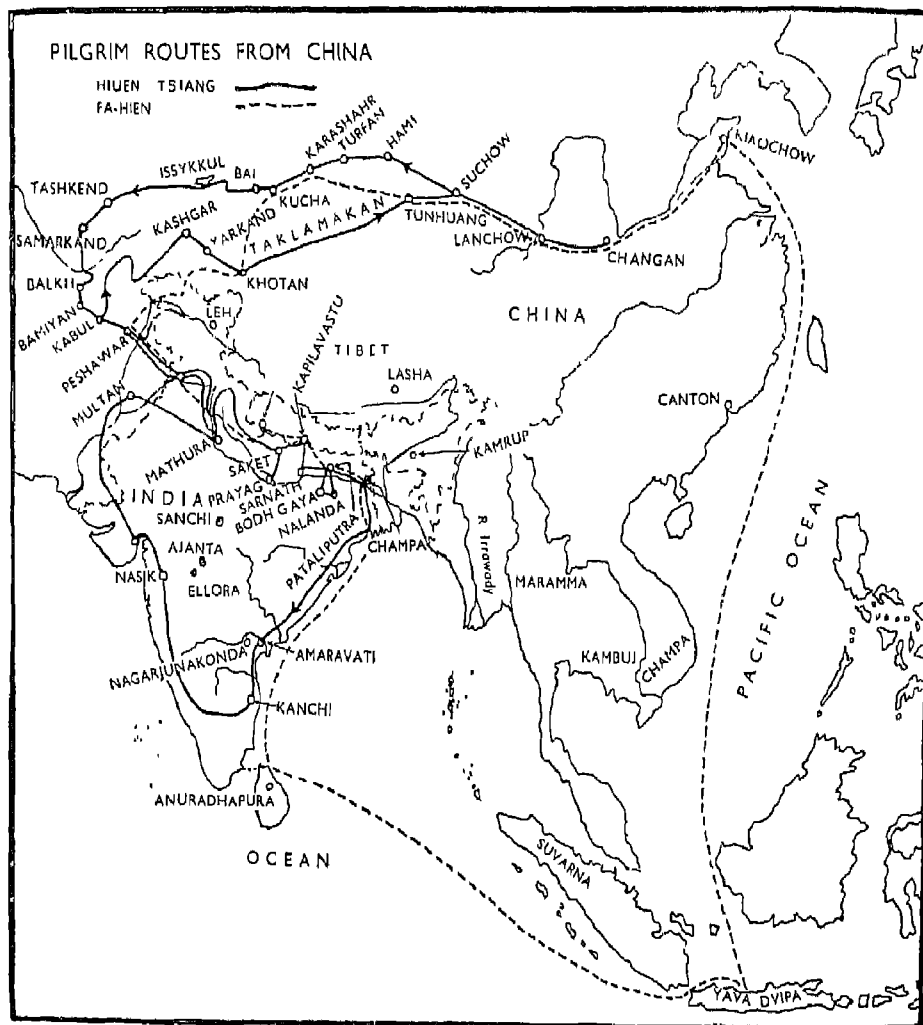
11. The distances from the place of start to the various destinations are of interest : Aden to the Indus 1,470 miles ; Aden to Broach, 1,700 miles, Myos-Hormos to Broach, 2,820 miles ; Bab-el-Mandeb to Cranganore, 2,000 miles. The journey from Suez to India, which may quite often have been made without a stop would be 3,000 miles.
12. *Decline and Fall of the Roman Empire*, Edward Gibbon, Modern Library, Volume I, pp. 49-50.

says : "The objects of oriental traffic was splendid and trifling ; silk, a pound of which was esteemed, not inferior in value to a pound of gold ; precious stones, among which the pearl claimed the first rank after the diamond, and a variety of aromatics, that were consumed in religious worship and the pomp of funerals. The labour and risk of voyage was rewarded with almost incredible profit." The Roman Senate considered the huge drain of gold and silver to the East in payment of these goods imported from the East of sufficient importance to record a serious protest and to ask for appropriate measures to counter it.

Transport in Gupta Times

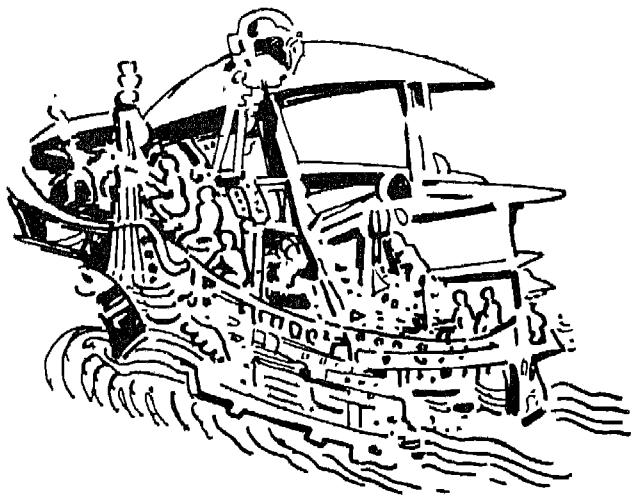
THE VOYAGE with the Periplus presented the picture of sea-faring activities on the West coast of India. There were also similar activities on the East coast. The conditions of inland transport must have been what they were for centuries past. Such sidelights as we get during the early centuries of the Christian Era are from the impressions recorded by foreign travellers. The main purpose of their visits being mainly religious quest, they paid little attention to the details of how they travelled. One of the famous travellers who has left behind interesting accounts about the state of politics, religion and common life is Fa-Hien, who, in the 5th century A.D., travelled all over India for more than ten years. His impressions of the general conditions during the time of Chandragupta II were that there was peace, prosperity and contentment in the Empire.

Hsuen Tsiang, another Chinese Pilgrim, visited India during the reign of Harsha. He refers, among other things, to the rest houses built for travellers throughout his domain. Many hundreds of merchants journeyed from distant Ayodhya to Tamralipti. The famous sea port called



Charitra of Kungada (modern Ganjam district) grew rich because of its maritime trade. The volume of foreign trade had increased by the 7th and 8th centuries A.D. The

articles which entered into foreign trade were Indian spices, pepper from no less than five ports of Malabar ; spices such as cinnamon, long and white pepper, cardamom and costus; fragrant trees, such as sandalwood; and saffron, aloes, cloves; pearls from the Tamraparni river (Hiuen Tsiang called it Malakuta), raw silk, silk yarn and silk robes, corals, copper from Calliana, diamonds and textiles. Among the imports were silk from China by the land route, ivory articles from Ethiopia, copper from the Western Mediterranean and sapphire from Ceylon.



Ship in Far eastern seas,
from frieze in Borobudur,
eighth century A.D.

Fa-Hien has given a vivid description of his return voyage in a merchant vessel bound for China. He has referred to the great perils of the sea and his narrow escape from a watery grave. The dangers, however, did not deter Indian merchants from daring them again and again and extending Hindu colonization and spreading Hindu culture in South East Asia as early as the first century A.D.

One of the problems of the foreign visitors in India and other countries, which we meet with again and again, is the danger of molestations from robbers. When going down the Ganga with 80 other fellow passengers on board a vessel to the east of Ayodhya, Hiuen Tsiang had the misfortune of being captured by a band of pirates from whose hands he could save himself only by a miraculous rise of a storm. The state of policing of the roads and the general law abidingness of the people in most parts of the country were, however, such that the solitary pilgrim from abroad had no reason to complain on this score.

Foreign commerce was naturally carried on mostly with the ports already mentioned. Cosmas writing in the early part of the sixth century makes mention of the important trading stations, which include Sindu, Kalyana, Sibor and no less than five markets of "Male" (Malabar on the West Coast) as well as "Marallo" (not identified) and "Caver" (Kaveripattnam) on the east coast. Among other ports which flourished during this period was Tamralipti at the head of Ganga delta, which was a port of call for Voyagers from the Far East. Traders came from China through Indonesia and the east coast of India to Ceylon, and proceeded further along the west coast to Persia, Arabia and Ethiopia. Ceylon was the meeting place of the ships from these ports of the world to take the goods from the Far East in exchange for the cargoes they had brought.

The Malay peninsula because of its geographical location was a convenient centre of carrying trade between India and the Far East. Takkola (the modern Tokua Pa) was the first landing stage of the Indian traders. Crossing the peninsula to the fertile plain on the eastern coast around

the bay of Ban Don they went by land or sea to Siam, Cambodia and Annam and further east.

The picture drawn in the light of the observations of the Chinese pilgrims have been confirmed in the thirteenth century by Marco Polo.

World Travel in the 13th Century A.D.

TRAVEL IN many countries of Asia and Europe had become more common as we leave the times of Hiuen Tsiang. Organized as well as individual travel to visit the Holy City, the Crusades to liberate Jerusalem from the control of the Muslim power and increasing trade with the East led to the opening up of more avenues of transport and travel. With the rise of Islam, pilgrims came from many lands to visit Mecca. Different caravans from various parts of the world proceeded towards the City, coming partly by sea and partly over land, facing the trials of storms, attacks of robber bands and the dangers of the desert. Trade increased and the modes of travel were improved.

We have two remarkable accounts of the state of economic life in different countries of the world from the eye witness accounts of Marco Polo and Ibn Batuta. About the year 1260 two enterprising merchants of Venice, brothers Niccolo Polo and Maffeo Polo, set sail from Constantinople to Sudak in search of a more profitable market for their

wares. In so doing they embarked upon some of the most extraordinary enterprises in foreign countries, and their account presents a fascinating saga of travel in many lands. They joined a caravan, taking a consignment of high cost goods to the market on the Volga where Barka Khan, Lord of the Western Tartars, had set up his capital. On a war breaking out here, the two took refuge at Bokhara, learning the Tartar language during their stay. Next we find them joining a diplomatic mission from the Khan of the Levant to his overlord Kubilai, the Khan of the Tartars in the far distant Cathay where no European had so far ever set foot. From Kubilai, they carried a mission to the Pope to introduce the Christian religion in his realm. The death of the Pope in the previous year with no successor chosen for three years, which they learnt at Acre, left the mission unfulfilled. They returned to Venice and ventured forth again to Acre where the new Pope Gregory gave his pontifical blessing to the enterprise with diplomatic credentials and two learned friars accompanied them, who, however, dropped out. The Polos then proceeded along to Cathay. For the next 20 years, the Polos were in the East. The permission granted by the Emperor of Cathay enabled them to travel extensively in the Mongolian empire. Their later travels took them to Peking, Burma and India.

Many persons have proceeded to the Far East either for trade or for religious motives. The first Catholic Archbishop to Peking, Giovanni di Monte Corvino, was appointed in 1307. In the *Merchant's Notebook* of Pegolotti (1340), there is mention of the route from the sea to Cathay being "perfectly safe, whether by day or by night."

Marco Polo has given some details, observed during the

visit to Bengal and other parts of India, and the voyage across the Arabian Sea.

The ships in which merchants trading with India made their voyages were built of spruce and fir. Most of them had at least 60 cabins, each comfortably accommodating one merchant. The ship had a steering oar and four masts adding, as occasion demanded, two more which were hoisted and lowered at pleasure. The hull was of double thickness which extended all the way around. It was caulked outside and in with a fastening done with iron nails.

According to the size of the vessel, the crews employed ranged from 150 to 300. They carried a much bigger cargo than the Venetian ships. Each would take as much as five or six thousand baskets of pepper. The ships were propelled by oars each manned by four seamen. To these ships were attached two or three smaller crafts, some manned by 60 seamen, some by 80, some by 100. These also carried substantial cargoes—some of them taking in 1,000 baskets of pepper. The smaller crafts were propelled by oars and often served to tow. A big ship also took with it as many as ten small boats lashed to its sides outboard for use in anchoring and catching fish and supplying their other needs.

After visiting Lokak and many countries of the Far East, the Polos reached Ceylon. Sailing westward, Marco Polo spoke of cocoanuts, apples of paradise, fruits, rice, sesame from which oil was extracted. "In this land and nowhere else in the world are produced superb and authentic rubies." It also produced other precious stones, namely, sapphires, topazes, amethyst, garnets and many other precious stones,

The King had the finest ruby in existence in all the world, "about a palm in length, the thickness of man's arm...the most brilliant object to behold in all the world, free from any flaw and glowing red like fire." The Great Khan sent an emissary, offering the value of a city in exchange for this ruby, but the King would not part with it for anything in the world, for it was an heirloom from his ancestors.

Marco Polo next arrived in the great province of Malabar "which is called greater India. It is indeed the best part of India....It is the richest and the most splendid province in the world." Pearls of great size and beauty are found here and the King derived immense revenue from the duty paid by the pearl fishery.

In the travels there is detailed reference to the realm of Quilon. "This country produces brazil (Quilon ginger) which is very good and also pepper in great abundance in all the fields and woods." Merchants came from Manzi and Arabia and the Levant, plying a thriving trade for the goods brought from their own country by sea, and took for export others in return. In some of these waters pirates operated on a big scale, seizing ships and robbing merchants. But the merchants who are familiar with these dangers came so planned and equipped that they ceased to be afraid.

The Pre-Railway Age

THE CONDITION of the roads and the means of transport improved with the revival of imperial administration in the country. During the time of Sultan Mohammad Tughluk, Ibn Batuta, the famous Moorish traveller, made good use of the network of roads which connected the capital towns of Delhi and Daulatabad. In the middle of the sixteenth century Sher Shah, the Afghan King, re-established the road system after long neglect. Shady trees were planted on both sides and 1,700 sarais were built and short distance kos minars (pillars) were erected. The Grand Trunk Road, about 1,500 kos in length, ran the whole length of the country from Sonargaon (near Dacca) to the Indus connecting the important towns in between.

Except for the extreme South, the Moghul Empire extended over almost the whole of Indian sub-continent and the military, economic and administrative necessities combined to place a special emphasis on a well-knit system of roads. Foreign travellers, like Tieffenenthaler, Bernier and Tavernier, spoke in admiration about the excellent state of the roads. When the struggle for power started between

Indian and foreign powers, political uncertainties led to serious neglect of the roads.

In the opening years of the nineteenth century there were several references to the utter lack of communications. Sir John Shore under date May 1833, wrote: 'as to the roads, excepting roads within the limits of civil stations, 16 miles between Calcutta and Barrackpore is all that we have to boast of.' The country was in a self-sufficient village economy and except for occasional visits of traders from outside bringing goods and articles not available in the locality, there was, generally speaking, hardly any movement of people from one place to another. Great pilgrim centres, of course, attracted large numbers of people, such as Varanasi, Triveni, Hardwar, Srirangam, and Rameswaram, and mass popular observances, such as Kumbh Mela and Maha Makha, of course, attracted perhaps even larger numbers from different parts of the country. So uncertain was the prospect of the return of a pilgrim from the south to the north, that his death was constructively presumed and obsequies performed. The risks of being waylaid and done away with or falling victim to sickness and to death were so great. The means of travel was mostly on foot or on bullock carts, when and where available.

It was only the military roads which were given some attention, and roads for common people were not considered necessary. The level plains of India scoured by streams for eight months or more in each year, can be crossed without difficulty by the conveyance generally used in the country. They offered so small an obstacle to movements between different localities, that there was no

demand for any prepared tracks for military purposes. Transport was chiefly effected on pack animals travelling along the village pathways while travellers could ride or be conveyed in *palkies* or palanquins. The movement was slow and travel was expensive and few could and did indeed undertake travel except those who could afford.

Horses were not common as they were imported and costly. The speed of the oxen which were in general use was compared by an Italian traveller Pietro de Valla (in 1623 A.D.), with horses ; they "run and gallop" and, according to Tavernier, "allow themselves to be driven like our horses." They could make long journeys, 12 or 13 miles a day and always at a trot. In Rajasthan, Gujarat and Sind, camels were in great abundance. A good camel can do 30 yojanas or 150 miles in one day. The trunk roads had trees planted on either side between Agra and Lahore and, according to Sir Thomas Roe, "the highway . . . looked like a delicate walk ; it is one of the great works and wonders of the world."

Oxen in caravan used to carry goods, particularly food grains, to important markets. Tavernier remarks "they give an ox a load weighing 300 or 350 livres, and it is an astonishing sight to behold the caravans numbering 10,000 or 12,000 oxen together, for the transport of rice, corn and salt . . . carrying rice to where corn only grows, and corn to where rice only grows, and salt to the places where there is none."

About the time taken for travel, Tavernier mentions that one could travel from Surat to Agra in a caravan in 35 or 40 days ; a journey between Agra and Patna a distance of about 550 miles took from 30 to 40 days. There were also

risks of robbery *en route*. What the means of transport achieved in the way of bringing within the reach of people the products of remote countries may be illustrated from the following remarks in the *Khulasat-ut Tawarikh* (1695 A.D.) about the great bazaar in Delhi.

“In this bazaar—where all precious and rare things of every country, port and city, rare and wonderful articles can be had—are brought and sold at one place, rubies of Badakhshan and sparkling pearls and sapphires, lustrous pearls of Oman, bright pearls, corals, and other lustrous jewels of sea and mines ; at another place various kinds of cloth, merchandise, weapons, foodstuffs and drinks, perfumes, and other articles which men require. At another place many kinds of dry and fresh fruits of every country.... Elsewhere elephants of renown, wind-paced horses and swift sumpter camels, and other animals in thousands and thousands.... Every day the bustle of the buying and selling of all commodities is great, and the crowd of buyers and sellers is beyond limit or calculation ; so much so, that you may here collect in one day all the royal articles suitable for the requirements of a kingdom; and the necessary outfit of a thousand soldiers could be got together in one hour, without the delay of preparation.”

Although the common folk stayed in their own homes living on the products of the farm or handicrafts or cottage industries, people of means used various forms of transport, namely, litters, doolies, chowdoolies, palanquins, etc. A coach of two oxen could be hired, Tavernier mentions, for about a rupee a day, so that the whole journey from Surat to Agra taking 35 to 40 days costs about 40 or 45 rupees. In

1800 Mr. Dexter, a stable keeper in Calcutta, advertised the following rates for the hire of conveyance on the European model and horses :

	<i>Per day</i> <i>Rs.</i>	<i>Per month</i> <i>Rs.</i>
a coach in four	24	300
a post chaise and pair	6	200
a pair of horses	10	130
a buggy and horses	5	100

Palanquins were used in cities and for long journeys. It was usually carried by 4 men, but 8 or 12 men were engaged for relieving one another. Elephants were also used with *hauzes* similar to modern *howdahs*.

Goods meant for export used to be sent by pack bullocks in caravans. The conditions in which the goods arrived at the ports, particularly goods susceptible to damage by rain, as cotton, left a good deal of risk to the trader and the merchant. Rivers mostly unbridged could be crossed only during the dry seasons. Considering the demands for good cotton from India for use by the British cotton mill industry, an English merchant expressed his despair : "Of what earthly use is the cotton produced by Broach if this could not be shifted to Bombay quickly enough and without damage on the way ?" The surplus commodities of districts were shifted only in small quantities as only such goods, could be reached to the ports of Bombay, Calcutta and Madras. It was only with the coming of roads that wheeled carts increased in number and were used for bringing articles from the countryside to towns and ports. For the really major change, the country had to wait for the advent of the Railways,

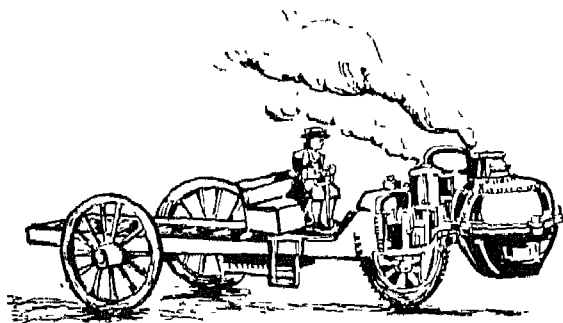
The Railway Age

THE WORLD was on the threshold of a great revolution, a revolution which ushered in a succession of inventions and widespread use of machinery.¹ The development and introduction of machinery depended on the availability of sources of power. At first water power was used and industries grew up on river banks where the flow of water turned the wheels to operate the machine. It was soon supplemented and later replaced by the use of coal and the steam engine which came into increasing use in a number of industries by 1781. Steam was used in navigation in Fulton on the Hudson river in 1807. But the really momentous change came with the invention and perfection of the locomotive by Sir George Stephenson in 1830.

The advantages of quick and cheap transport were perceived almost immediately when the effect of speed in covering distances enabled goods to be produced for more distant

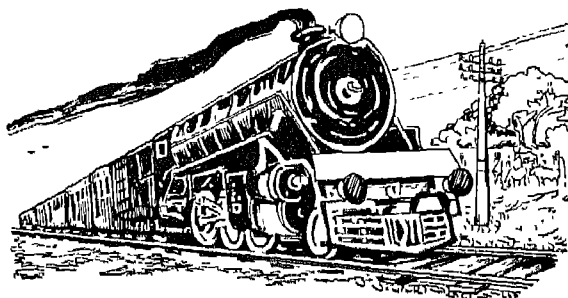
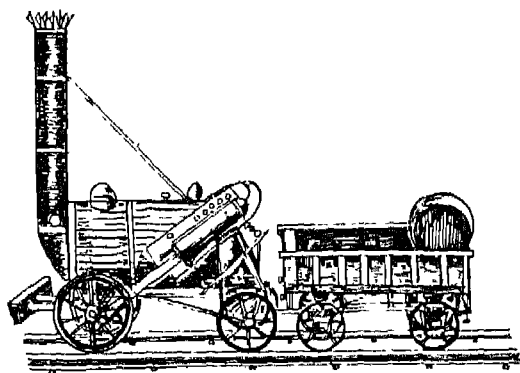
1. An improved loom was built by John Kay in 1733. In 1764 Hargreaves invented the spinning jenny ; in 1769 Arkwright brought out his spinning frame; in 1779 Crompton combined the device of these two in his mule and improved the spinning machine further.

EXPERIMENTS IN STEAM LOCOMOTIVES



Nicholas Joseph Cugnot's
invention, France 1770

Model of George Stephen-
son's Rocket Locomotive,
Liverpool and Manchester
Railway, 1829



Present day steam locomotive, a giant as compared
with the earlier types

markets. This meant increased production, and increased production led to greater use of machinery.

From England, railways spread to the countries of Europe. The United States had its own indigenous enterprise which was reinforced by British assistance. Railway development soon came to the other countries—Canada, South America, India and other countries of Asia, South Africa and other regions of Africa and Australia.

The Stockton and Darlington Railway was the first steam railroad in England. It hauled initially only goods. Until 1835 the passengers on the line rode behind the horses. Stephenson tried something bigger in the Liverpool-Manchester Railway for which he designed a husky new locomotive *Rocket*, which could draw three times its own weight at $12\frac{1}{2}$ miles an hour. It was a triumph, and in the very first year the *Rocket* carried more than 70,000 persons and 4,000 tons of weight.

The railways, however, were not so readily welcome. Many landowners resisted the encroachment of the railway lines on their lands and of these "black monsters of locomotive engines with trailing clouds of smoke disfiguring the landscape," destroying the privacy and seclusion of their estate and causing a great decrease in the value of their lands. Introduction of such "infernal" machines must, they said, be stoutly resisted.

Extraordinary statements were made about the dangers of the railway. The smoke of the engine would kill the birds, cattle would be terrified, cows would cease to give their milk, the sparks from the engine would set fire to the houses and manufactories on the line of route; the race of horses would become extinct. Many other dire consequences were

predicted. A panel of London scientists pronounced that the train should never go faster than 30 miles an hour, otherwise "passengers would suffocate". The Medical Faculty at Munich warned that all railway passengers were sure to contract new type of mental illness called *Delirium ad furiosum*.

The unqualified success of the new method of transportation drowned the voices of ill-informed and unimaginative critics. Wherever the railway was started, it became popular and a success.

In India railways came within 28 years of the first train that ran in London between Stockton and Darlington. From Bombay to Thana, a stretch of 21 miles, was the first line built in India by the Great Indian Peninsula Railway Company. Fourteen railway carriages with 400 guests left Bori Bunder at 3.30 P.M. "amidst loud applause of a vast multitude and to the salute of 21 guns" on 17 April 1853.

The party reached Thana at about 4.45 P.M. where refreshments were served and the new Company was felicitated. The guests returned to Bombay at 7 P.M. The next day Sir Jamshedji Jeejeebhai, the second Baronet, reserved the entire train and travelled from Bombay to Thana and back along with some of the members of his family.

Soon this line was to be extended further by stages to Delhi. Another railway line was built from Howrah, the first train steaming out of Howrah station to Hooghly, a distance of 24 miles, on 15 August 1854. Howrah in 1853 could be reached from Calcutta only by boat across the river. There were 3,000 applications from those who wanted to ride in the first train. It left for Hooghly on 15 August in fully packed capacity reaching there in 91

minutes. The train consisted of three First class, two Second class, three trucks for Third class passengers and a break van for the guard, all built in India. The First class fare was Rs. 3/- and Third class 7 annas. The official opening of the East Indian Railway was, however, made on Saturday, 3 February 1855 at Burdwan. This line was also to get steadily extended towards Delhi.

In South India the first line was opened on 1 July 1856 by the Madras Railway Company between Vyasarpady and Walajah Road (Arcot), a distance of 63 miles. A number of other Railway Companies were also formed during this period, the more important of which were the Great Southern of India, (later the South Indian Railway), the Bombay Baroda & Central India Railway, the Oudh & Rohilkhand Railway, the North Western Railway and the Burma Railway.² The mileage constructed grew rapidly, reaching 838 miles in 1860. It increased to 4,771 by 1870, 8,996 by 1880, 16,404 by 1890 and 24,752 by 1900.

During the present century the extensions to the Railway network continued till 1936-37, reaching a total of 43,128 miles. When Burma was separated in the year following, the Burma Railways were also separated from the Indian Railways and the mileage was reduced to 41,076. Further contraction of the Indian Railway system took place in 1947-48. With the partition of the country, the mileage of the lines falling in Pakistan became part of its railway system, and the mileage of the Indian Railways became 33,985.

It would be of interest to consider the effect of the development of Indian Railways on the country.

2. Burma was then part of the Indian Empire.

The Transport Revolution—Shape of Things to Come

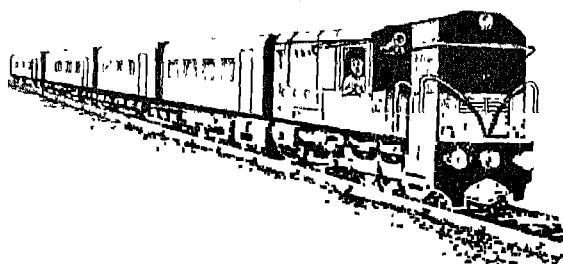
THE RAILWAYS made far-reaching changes in the conditions of the life of the people. A railway line passing through an area hitherto not reached, except by slow and primitive methods of travel, suddenly brought it on the road to big towns, cities and ports. The surpluses of some areas were, before the railways came, of little use to the local people, whose wants were already satisfied. The Railway helped these to find a market outside and earn an income for the producers. Similarly, articles produced outside the area also found a market in these hitherto inaccessible parts.

The need to connect the villages with the Railway station gave a powerful encouragement to the building of roads. Wherever demand came from outside for local goods and locally for articles from outside, roads sprang up connecting rural areas with the nearest railway station. Better prices were obtained, and these meant increased incomes to cultivators and village artisans.

In a country mostly dependent on its agriculture, failure of the monsoon meant ruin and famine to large numbers of people. Before the development of the Railways, the surpluses of neighbouring districts in the absence of communications availed little to those threatened or affected by scarcity or famine. For, there was no means of carrying the surplus to places where it was urgently needed. The railways helped to remove these disabilities in many parts of the country.

Of equal, if not of greater importance, were the contributions the railways made to better and more efficient administration, and the maintenance of law and order. Government officers were able to visit places away from their headquarters at quick intervals and without long absence from the State capitals. The railways also played an important part in connection with the defence of the country because troops as well as equipment and supplies could be moved to threatened points quickly and at short notice.

The social effects of the railways and roads were no less pervasive. In a country of continental dimensions people talked many languages and had different customs and manners. There was formerly seldom much travel and opportunities for social intercourse were few. When the railways came, travel became cheap, taking far less time to cover distances than before. People took to travel oftener than before for economic reasons, such as for employment in cities, business houses, and factories, for trade and professions. The railways were probably the most effective unifying factor in the country. The railways and roads were the means of bringing together peoples of foreign countries and people in India.



A Diesel-Electric Locomotive hauling a passenger train

These influences tend to grow faster as time goes on. Life then becomes inextricably bound up with the functioning of road and rail transport. People move about nowadays in a manner that would have been thought impossible even thirty or forty years ago. So also are goods carried from place to place. In 1967-68 when the country had a total population of 511 million, each person on an average made 4.4 rail journeys during the year, and paid Rs 4.95 on his rail travel. An average passenger did 29 miles (47 kilometres) during the year.

An Electric Locomotive hauling a passenger train

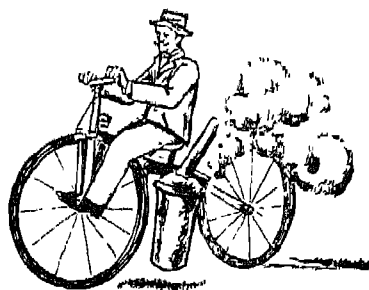
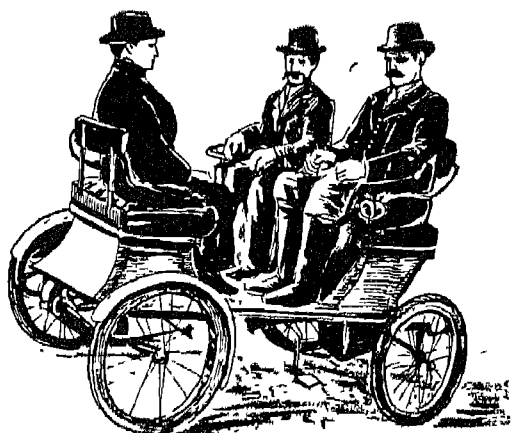


The goods carried per head of population during 1967-68 was 47 lbs. (21 Kgs.) and the average distance to which they were carried 373 miles (601 kilometres). Rail transportation

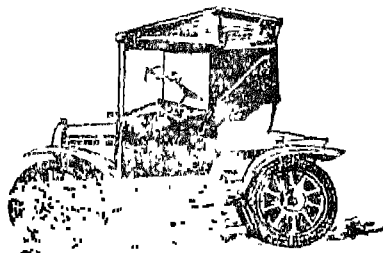
has become so closely intertwined with our daily lives that if anything happens to interrupt it, our activities would be paralysed.

Cheaper transportation led to people moving towards places where there were Government offices, industry, trade, shipping, banking, insurance and other activities in search of employment. The growth of towns and cities under these influences has been phenomenal. Even so has been the travel connected with this. The rail journeys associated with the cities of Bombay, Calcutta and Madras exceeds a thousand million a year. Such a volume of traffic calls special methods of carrying it, such as tramways, town buses, underground railways or subways.

Rope Steam Velocipede about 1868

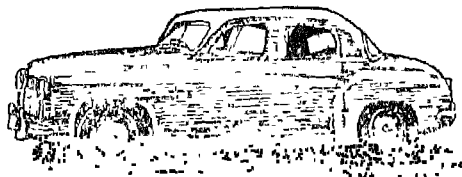


3½ D.C. De Dion Bouton
Voiturette, 1898



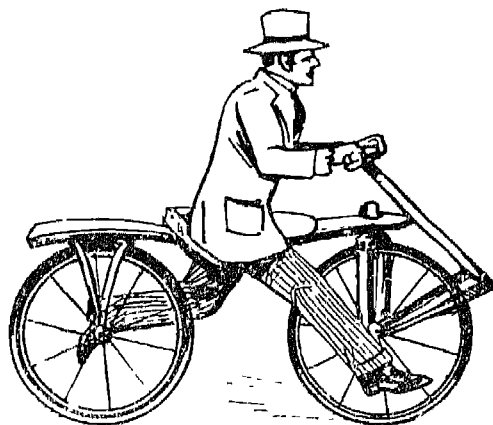
7 h p. Austin Voiturette, 1909

Modern Car (Medium type)

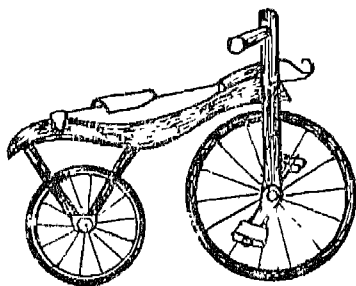


Close on the heels of the railways came the automobile. Although motor transport came to India within a few years of its advent in other countries, its main impact occurred during the inter-war period. With more cars, buses and trucks, better roads came to be developed to stand up to the ever-increasing volume and pressure of traffic. Roads and road transport were in a comparatively backward state till recently. Between 1947 and 1966, however, the motor vehicles on the roads almost quadrupled. The length of roads more than doubled over the same period, touching almost a million kilometres. The expansion has come about largely through the expenditures incurred under the Five Year Plans. Motor vehicles and spare parts, which used to be imported, are now mostly manufactured in the country.

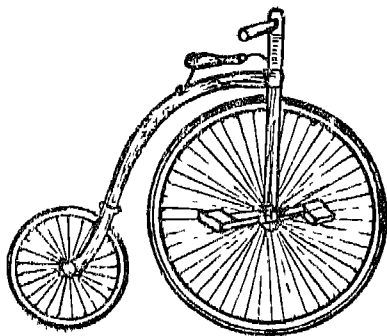
Road transport has transformed completely the countryside. With greater mobility of people has come far greater economic activity than ever before,



The bicycle, also called cycle, has, for reasons of cheap cost, simplicity of operation, hardly any expense for maintenance and ready availability, become one of the most popular means of transport for people with low income. It has advantages of greater speed and has lent itself to further improvement into power-driven vehicles, such as motor cycles, scooters.

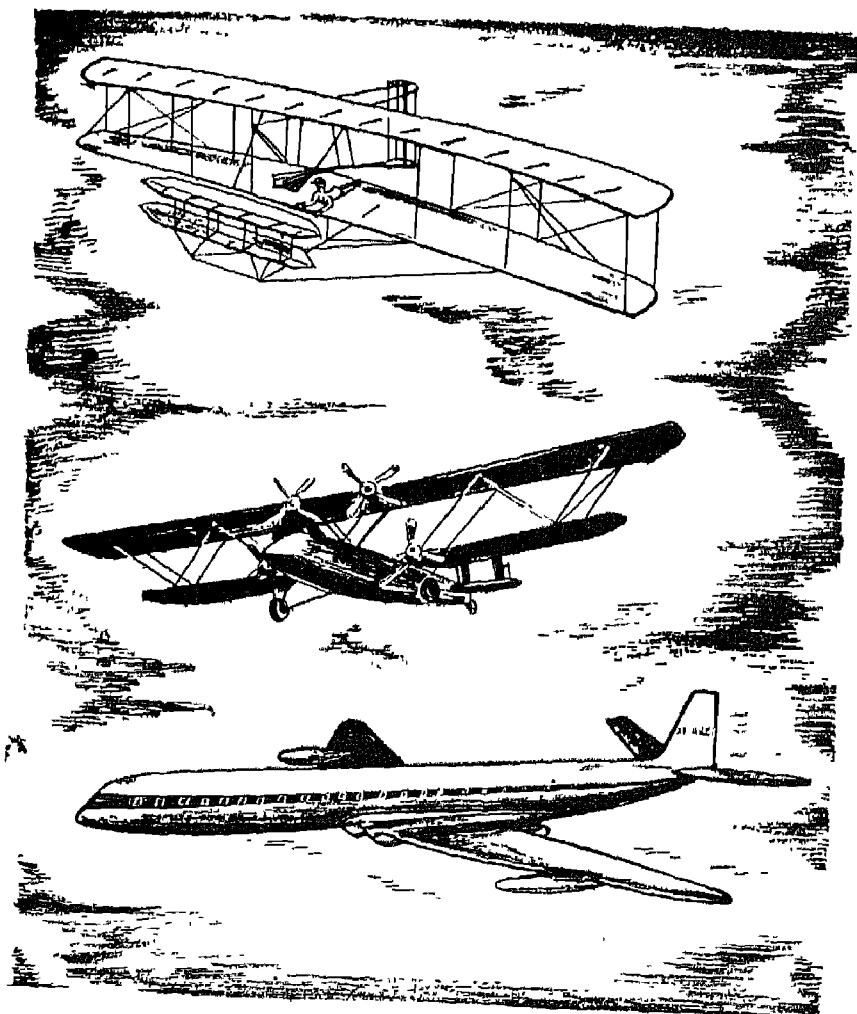


Top—First practical Dandyhorse was invented by Baron von Drais Sauerbourn of Germany in 1816. The rider moved it by pushing his feet against the ground.



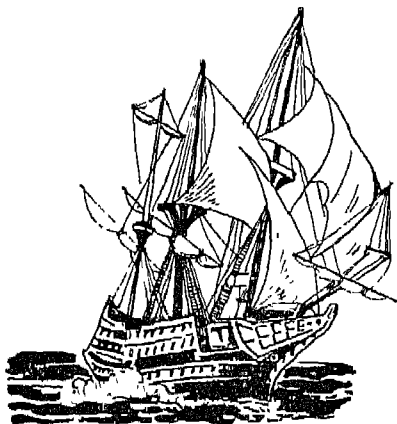
Middle—Ernest Michaux in France produced a machine that had pedals attached to the hub of the front wheel (1855) Michaux built the first bicycle factory, where 200 workers produced 140 bicycles a year.

Bottom—Then came the Pennyfarthing in 1870's with large front wheel and a small wheel at the back. Safety bicycle with chain and two wheels of same size were built in England about 1885. In 1889 John Dunlop of England added inflated rubber tyres and the modern bicycle was almost complete.

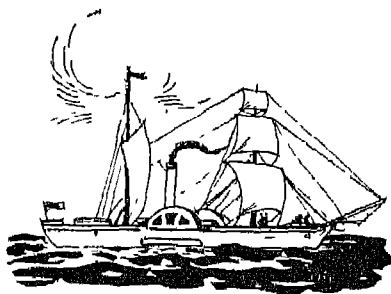


Top—Wright Brothers' first manned Aeroplane (1903)
Middle—Commercial biplanes twenties
Bottom—The De Havilland Comet jet airliner (cruising speed
500 m.p.h.)

Probably the most spectacular upsurge in transportation in the twentieth century has been the coming in of air transportation. Prior to World War II, air travel started in a small and limited scale. The greater speed of travel by air slashed the time taken to cover long journeys, and the demand for this grew rapidly. During World War II air attacks and defence took an important role, and many in India obtained training and opportunities to operate the craft. When the war was over, many companies took advantage of the Defence surplus aircraft to operate commercial services. Many companies meant competition over too little traffic and this led to the formation of two public Corporations—the Indian Airlines for domestic traffic and the Air India for international traffic—from out of the existing companies. Traffic has grown and from the humble Dakotas, new planes have come into use larger in size and



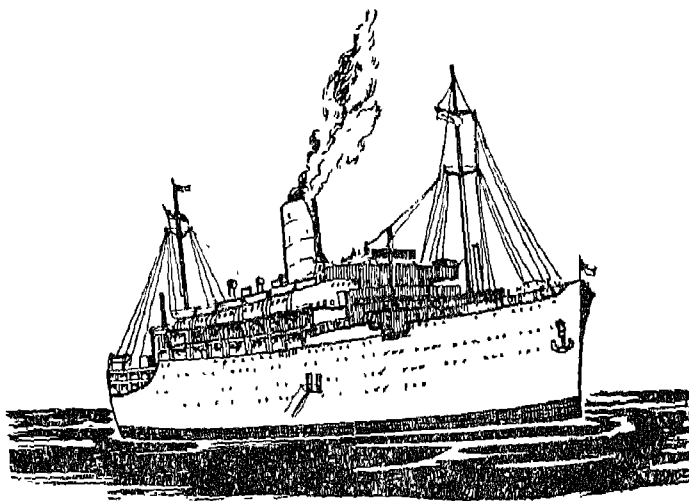
English Ship of the seventeenth century



Ship during early years of steam navigation

faster in flight. The Jet has come to India with the Caravelles in local services and the Boeings in international flights. Now, the Jumbo Jet has also come with a carrying capacity of over three hundred passengers.

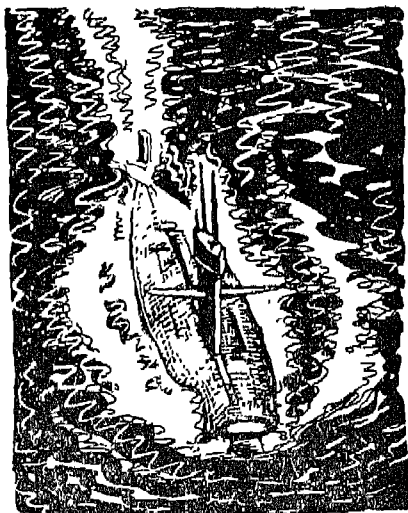
Sea transport has also undergone vast changes not dreamt of in the past. Giant carriers of 100,000 and 200,000 tonnes—even 300,000 before long—are coming into use, dwarfing completely the vessels which have been handling our foreign trade in the past.



A 23,500 ton modern ship

What has come about during the last quarter century is something that has outpaced the achievements over centuries. Man's conquest over the powers of Nature has been taking place at a much faster pace than ever before. With the inventions that have been put to use by Man in space flights

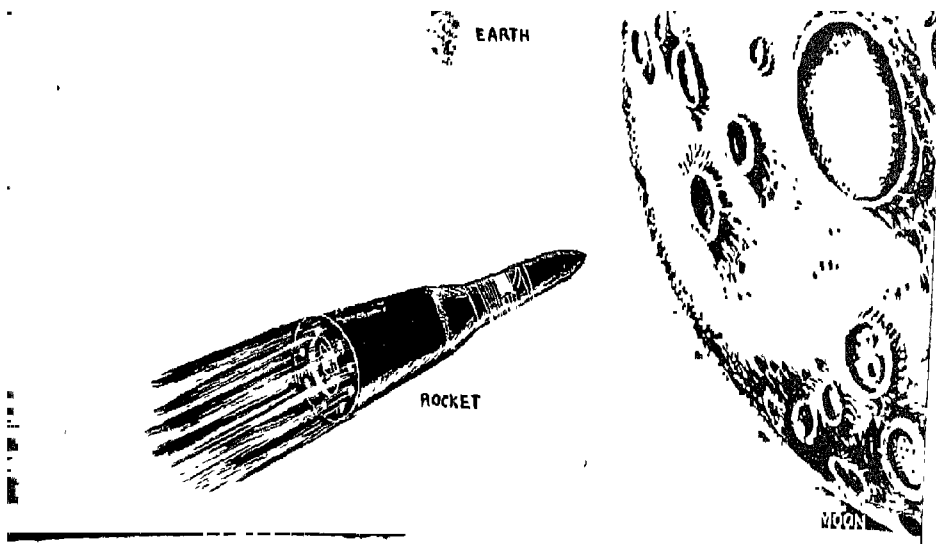
in recent years the achievements in transport at incredible speeds, faster than sound, have outpaced imagination. These have placed in man's hands knowledge and techniques that promise to bring about still more revolutionary changes in the future. It is not possible to say what shape these will take. But some pointers are available to show which way they may take us.



Nuclear-powered submarine "Skipjack" of U.S. Navy (Speed more than 20 knots while fully submerged)

The nuclear-power has begun to unfold the possibilities of cheaper electricity in the future.

On about 11 pounds of uranium an atomic-powered locomotive on present calculations is expected to operate for a year, developing 7000 horse power or about four times the power of the diesel-electric locomotive, at twice the cost. Railway working may become much cheaper than at present.



New Age of Astronauts

The application of nuclear power to submarine navigation appears to hold immense possibilities. On a single charge of 8 lbs of fuel, the U.S. Submarine *Nautilus* did 60,000 miles under water. For the same voyage it would have required 10,000 tons of oil. Nuclear-powered submarine ships, which can run faster because under water there will be no winds and storms or waves and surface drags, reaching 60 knots, may before long replace surface ships.

The success of jet engines in air transport has proved that Man can fly at speeds of over 1000 miles per hour, faster than the rotation of the earth on its axis. He can take off at sunrise and travel to his destination with no change in the sunrise. If he travels faster than this he will travel back in time—starting at sunrise and seeing dawn again on destination,

In space flights to the Moon, Man has stood speeds varying from 2000 to 25000 miles per hour. The mastery of remote control and guidance systems may possibly find some applications in a centrally-worked railway trains, planes and ships.

With our city roads getting choked with vehicles bringing their movement during peak hours to almost a snail's pace, a way out is seen in a moving road surface on conveyor belts, say three or four, at different speeds. This may do away with vehicles in cities, as well as the pollution of air by them, noise and confusion.

The astonishing rapidity with which the developments have come about during the last thirty years will make one wonder whether in another thirty years, say by 2000 A.D., a wholesale transformation of transportation may not come about—moving roads in cities, fast inter-city monorail services, long distance travel by jet-rocket planes at supersonic speeds, and submarine leviathans at great velocities for passenger and goods traffic.

Man has travelled a long long way over millions of years of his evolution from his sole reliance on bare feet to carry him. Considering the tremendous changes that have been passed in rapid review in the preceding pages, who knows if far greater surprises than he has known do not await. One can dimly sense, like Keats,

“a budding morrow in the night.”